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tied, the existence of geometrically isomeric forms of its derivatives seemed at the outset more than probable, and during the progress of the investigations which for many years have been carried on in this laboratory careful search had been made for such bodies, but hitherto only the two isomeric dibromfurfuran tetrabromides of Hill and Hartshorn * had been discovered. Since the discovery of the χ dichlorpyromucic acid, which we made toward the close of our work, we have attempted to prepare the corresponding bromine derivative, but as yet without success. The isolation of the body $C_4H_3BrO_2$, which Hill and Sanger † found among the products of the decomposition of pyromucic tetrabromide by alkalies, certainly is an indication of the previous existence of such an acid, although it is by no means clear in what stage of the process the decomposition of the acid was effected, nor how the decomposition product itself escaped further alteration. Any detailed consideration of the geometrical structure of pyromucic acid we feel obliged to postpone until more facts bearing upon the question are at our disposal.

II. — ON CERTAIN DERIVATIVES OF FURFURACRYLIC ACID.

By H. B. Gibson and C. F. Kahnweiler.

Presented May 28, 1889.

The preparation of furfuracrylic acid was described by v. Baeyer ‡ 1877. At that time, however, the investigation of the acid was pushed in but one direction, and the successive steps by which it could be converted into *a* pimelic acid were alone described in detail. It seemed that a further study of the acid in other directions also could hardly fail to yield interesting results.

The ready decomposition of furfuracrylic acid by mineral acids compelled us to relinquish the line of work we originally had proposed to follow, and we consequently began an investigation into the nature of this decomposition. The study of the action of hydrochloric acid upon an alcoholic solution of furfuracrylic acid was just beginning to yield us results when the paper of Markwald * upon the same subject reached us, and we were therefore obliged to abandon our work in this direction, and turned our attention to the products formed by the action of bromine, which promised to repay investigation. We felt ourselves quite at liberty to continue our study of furfuracrylic acid in this direction, since Markwald had declared himself unable to obtain well defined crystalline products in this way.

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* Berichte der deutsch. chem. Gesellsch., xviii. 450.

† These Proceedings, xxi. 158.

‡ Ber. d. deutsch. chem. Gesellsch., x. 355.

FURFURACRYLIC ACID.

In the preparation of furfuracrylic acid we have found it to our advantage to modify slightly the proportions given by v. Baeyer, and in this respect our experience agrees more closely with that of Markwald. We have heated 2 parts of furfurol with 3 parts of fused sodic acetate and 3 parts of acetic anhydride with reverse cooler at 160–170° for about ten hours, extracted the acid with a dilute solution of sodic carbonate, precipitated with hydrochloric acid, and recrystallized the product thus obtained from boiling water. Although the yield varied somewhat in successive preparations, we frequently obtained an amount equal to the weight of furfurol employed. The melting point of the pure acid we found to be 140°, in agreement with the observations of Jaffe and Cohn,† instead of 136° as given by v. Baeyer. From the acid we made the methyl ether and the amide, which we may describe a little more in detail, since no description of them has yet been published.

Methyl Furfuracrylate, $C_7H_5O_3 . CH_3$. — By precipitating with argentic nitrate a solution of ammonic furfuracrylate the silver salt was obtained as a heavy curdy precipitate. This was carefully dried and treated with an excess of methyl iodide. When the decomposition was complete the product of the reaction was extracted with ether, and purified by distillation under diminished pressure. Under a pressure of 15 mm. the methyl furfuracrylate distils unchanged at 112°, and the distillate solidifies in beautiful rhombic crystals which melt at 27°. Under a pressure of 774 mm. we found that the ether distilled without apparent decomposition at 227–228°. It possessed an agreeable characteristic odor, and dissolved readily in alcohol, ether, ligroin, or benzol. An analysis gave the following results: —

0.2224 grm. substance gave 0.5157 grm. CO_2 and 0.1084 grm. H_2O.

	Calculated for $C_8H_8O_3$.	Found.
C	63.17	63.23
H	5.26	5.42

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* Ber. d. deutsch. chem. Gesellsch., xx. 2811.

† Ibid., xx. 2315.

Furfuracrylamide, $C_7H_5O_2 . NH_2$. — Concentrated aqueous ammonic hydrate acted but slowly upon methyl furfuracrylate in the cold, but at 100° in sealed tube the decomposition was readily effected. The amide was sparingly soluble in cold water, more readily in hot water, and crystallized in pearly scales which melted at 168–169°.

I. 0.4076 grm. substance gave 35.5 c.c. moist nitrogen at 21°.4 and under a pressure of 766 mm.

II. 0.4590 grm. substance gave 41.9 c.c. moist nitrogen at 21°.7 and under a pressure of 767 mm.

	Calculated for $C_7H_7NO_2$.	Found.	
		I.	II.
N	10.22	9.98	10.45

Action of Bromine.

It had already been observed by v. Baeyer that furfuracrylic acid was readily attacked by aqueous bromine, but he had made no careful study of the products formed. Since the product formed in this way was uninviting, and the reaction undoubtedly complicated, it seemed advisable to study instead the action of dry bromine, which might yield well characterized addition products. We soon found, however, that with dry bromine even in the cold substitution was readily effected, so that the simplest well defined product contained three atoms of bromine. Subsequent study showed that this product was a saturated compound in which one atom of bromine had taken its place in the furfuran ring.

Bromfurfurdibrompropionic Acid, $C_7H_5Br_3O_3$. — If furfuracrylic acid is suspended in ten times its weight of carbonic disulphide and two molecules of dry bromine added, a clear deep red solution is at once obtained, from which hydrobromic acid is soon evolved in quantity. Although the reaction progresses steadily at ordinary temperatures, it may be greatly hastened by heat, and we usually have heated the mixture upon the water bath soon after the addition of the bromine. When the evolution of the hydrobromic acid slackens, and a crystalline substance has separated in quantity, the solution is well cooled, filtered, and the crystalline solid well washed with cold carbonic disulphide. The substance then gives on analysis percentages which closely agree with those required by the formula $C_7H_5Br_3O_3$; but it may still further be recrystallized from hot benzol or carbonic disulphide.

I. 0.2080 grm. substance gave 0.3117 grm. AgBr.

II. 0.3798 grm. of substance recrystallized from carbonic disulphide gave 0.3099 grm. CO_2 and 0.0502 grm. H_2O.

III. 0.2005 grm. substance recrystallized from benzol gave 0.2998 grm. AgBr.
IV. 0.2003 grm. substance recrystallized from benzol gave 0.2993 grm. AgBr.

	Calculated for $C_7H_5Br_3O_3$.	Found. I.	II.	III.	IV.
C	22.28		22.26		
H	1.33		1.47		
Br	63.66	63.78		63.65	63.60

Bromfurfurdibrompropionic acid crystallizes in small flat oblique prisms, which are sparingly soluble in cold benzol or carbonic disulphide, more readily in hot. It is readily soluble in alcohol or ether, insoluble in water, although slowly decomposed by it. On heating, the acid is gradually decomposed, with the evolution of hydrobromic acid and slight carbonization. As might be expected, we found it impossible to prepare salts, or even ethers, of the acid.

The action of cold water upon the acid was so well marked, that we proceeded to determine the products formed. When bromfurfurdibrompropionic acid is suspended in water, carbonic dioxide soon begins to escape, and after long standing the crystalline solid is completely converted into a colorless oil. The aqueous solution then contains hydrobromic acid in abundance. As the decomposition was greatly facilitated by gentle heat, we usually have allowed the reaction to proceed at about 40°. When the decomposition was complete, we distilled with steam, and dried the heavy colorless oil thus obtained with calcic chloride. On distilllation under diminished pressure, we found that this oil began to boil at 108° under a pressure of 14 mm., and that the thermometer gradually rose to 112° the pressure remaining constant. The distillate was at first nearly colorless, and of high refractive power, but on standing it quite rapidly became dark-colored. Analyses of the freshly distilled substance showed it to be a bromfurfurbromethylen.

I. 0.3173 grm. substance gave 0.3350 grm. CO_2 and 0.0476 grm. H_2O.
II. 0.1928 grm. substance gave 0 2883 grm. AgBr.
III. 0.2045 grm. substance gave 0.3056 grm. AgBr.

	Calculated for $C_6H_4Br_2O$.	Found. I.	II.	III.
C	28.57	28.79		
H	1.59	1.67		
Br	63.49		63.65	63.60

The reaction is then strictly analogous to that by which β bromstyrol may be made from phenyldibrompropionic acid:

$$C_7H_5Br_3O_3 = C_6H_4Br_2O + CO_2 + HBr.$$

The aqueous solution left in the retort after distillation with steam deposited on long standing a small quantity of a crystalline acid. The quantity of this acid was so insignificant that we were able to identify it only after uniting the products obtained in many successive preparations. Two determinations of the percentage of bromine showed the acid to be the bromfurfuracrylic acid subsequently described. Lack of material made it impossible to prove with precision the identity of the two acids, and we can therefore only assert their close resemblance.

I. 0.1262 grm. substance gave 0.1091 grm. AgBr.
II. 0.1956 grm. substance gave 0.1700 grm. AgBr.

	Calculated for $C_7H_5BrO_3$.	Found.	
		I.	II.
Br	36.86	36.79	36.99

We have hitherto been unable to find other definite products of the reaction.

By the action of bromine upon bromfurfurbromethylen we could obtain no products which invited further study. On the other hand, alcoholic potassic hydrate gave us the corresponding acetylen derivative, although we have not yet isolated it in a pure condition. The oil obtained as the direct product of the reaction contained much too large a percentage of bromine, and prolonged action at a higher temperature gave no more satisfactory results. That the oil contained the acetylen derivative was readily shown by its behavior with an ammoniacal solution of silver or copper. The silver compound was white, the copper compound a greenish yellow. The latter was made in larger quantity, carefully washed by decantation, and dried over sulphuric acid. It then exploded violently by heat or on contact with fuming nitric acid, and contained the required percentage of copper.

I. 0.6479 grm. substance gave by electrolysis 0.1748 grm. Cu.
II. 0.6178 grm. substance gave 0.1681 grm. Cu.

	Calculated for $[C_6H_2BrO]_2Cu_2$.	Found.	
		I.	II.
Cu	27.16	26.98	27.20

From the copper compound we attempted to prepare the bromfurfuracetylen in a pure condition. By decomposing with acid, extracting with ether, and distilling the well dried extract under diminished pressure, we obtained a colorless oil which boiled at 65–68° under a pressure of 19 mm. This oil contained a percentage of bromine, which left no doubt as to its identity, but showed at the same time that it was still impure. We have as yet made no further attempt at its complete purification.

It seemed to us of interest to prepare by oxidation the diacetylen derivative also, analogous to the diacetenylphenyl of Gläser,* which was afterward more fully studied by v. Baeyer and Landsberg.† In its preparation we followed closely the method of v. Baeyer. To the copper compound was added one molecule of potassic ferricyanide in aqueous solution. When the oxidation was complete, the precipitate formed was collected on a filter, dried, and extracted with hot alcohol. On cooling the alcohol deposited the new compound in small iridescent plates which melted at 126°. It was readily soluble in hot alcohol, sparingly in cold alcohol, and dissolved freely in ether, chloroform, benzol, or ligroin. Analysis showed the substance to be dibromdifurfurdiacetylen (diacetenylbromfurfuryl):

$$C_4H_2BrO - C \equiv C - C \equiv C - C_4H_2BrO.$$

I. 0.2476 grm. substance gave 0.3888 grm CO_2 and 0.0383 grm. H_2O.
II. 0.1538 grm. substance gave 0.1696 grm. AgBr.
III. 0.1548 grm. substance gave 0.1702 grm. AgBr.

	Calculated for $C_{12}H_4Br_2O_2$.	Found. I.	II.	III.
C	42.36	42.82		
H	1.18	1.72		
Br	47.06		46.93	46.79

Bromfurfuracrylic Acid.

The behavior of the acid containing three atoms of bromine which was obtained by the direct action of bromine upon furfuracrylic acid left little doubt that it was a bromfurfurdibrompropionic acid. If this view were correct, it seemed not improbable that the bromine attached to the the side-chain might be removed without disturbing the bromine in the furfuran ring, and that a bromfurfuracrylic acid would thus be formed. After a few preliminary experiments it was found that zinc dust added to an alcoholic solution of the bromfurfurdibrompropionic acid brought about the desired result. The reaction is vigorous, and the boiling point of the alcohol soon reached. When the reaction is over, water is added to the filtered solution, and the acid which is thus precipitated is purified by conversion into its sodium salt, reprecipitation with hydrochloric acid, and recrystallization from dilute alcohol or boiling water. The yield of the new acid thus obtained was between 80 and 90 per cent of the theoretical amount, and analysis showed that it had the desired composition.

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* Ann. Chem. u. Pharm., cliv. 159.

† Ber. d. deutsch. chem. Gesellsch., xv. 57.

I. 0.2645 grm. substance gave 0.3768 grm. CO_2 and 0.0566 grm. H_2O.
II. 0.2511 grm. substance gave 0.2161 grm. AgBr.
III. 0.2223 grm. substance gave 0.1920 grm. AgBr.
IV. 0.1490 grm. substance gave 0.1288 grm. AgBr.

	Calculated for $C_7H_5BrO_3$.	Found. I.	II.	III.	IV.
C	38.71	38.86			
H	2.30	2.38			
Br	36.86		36.63	36.76	36.80

Bromfurfuracrylic acid crystallizes in long slender prisms, which are sparingly soluble in cold water, more readily in hot water. The acid dissolves readily in alcohol, ether, hot benzol, or hot chloroform, in cold benzol or cold chloroform it is but sparingly soluble, and it is nearly insoluble in ligroin. It melts sharply at 176–177°, but since it is somewhat decomposed and blackened by long continued heating above 150°, the bath must first be heated to within a few degrees of the melting point. Small quantities of the acid may readily be sublimed between watch-glasses. The sublimed product also melts at 176–177°, and darkens upon long heating. With bromine the acid unites readily, and forms the original substituted propionic acid. We have made many attempts to convert the acid into the corresponding substituted pyromucic acid, or to obtain from it by oxidation a product which should enable us to fix the position of the bromine atom, but hitherto without success. We can, therefore, at present only conjecture that the bromine in this case, as with the pyromucic acid, enters first the δ position. For the further characterization of the acid we have prepared a few of its salts.

Baric Bromfurfuracrylate, $Ba(C_7H_4BrO_3)_2 . H_2O$.—The barium salt is sparingly soluble in cold water, somewhat more readily in hot water, and crystallizes in clustered needles. When air-dried it loses nothing over sulphuric acid, gives up one molecule of water slowly at 100°, and is decomposed at a somewhat higher temperature.

I. 1.1830 grm. of the air-dried salt lost at 100° 0.0380 grm. H_2O.

II. 0.7064 grm. of the air-dried salt lost at 100° 0.0227 grm. H_2O.
III. 0.4898 grm. of the air-dried salt gave 0.1951 grm. $BaSO_4$.

	Calculated for $Ba(C_7H_4BrO_3)_2 . H_2O$.	Found. I.	II.	III.
H_2O	3.07	3.21	3.21	
Ba	23.34			23.42

I. 0.5258 grm. of the salt dried at 100° gave 0.2149 grm. $BaSO_4$.
II. 0.4787 grm. of the salt dried at 100° gave 0.1955 grm. $BaSO_4$.

	Calculated for $Ba(C_7H_4BrO_3)_2$.	Found. I.	II.
Ba	24.07	24.02	24.01

Calcic Bromfurfuracrylate, $Ca(C_7H_4BrO_3)_2 . 3\,H_2O$. — This salt crystallizes in columnar aggregations of plates, and is sparingly soluble in cold water, more readily in hot water. The air-dried salt effloresces over sulphuric acid, and is gradually decomposed at 100°, but may be dried without difficulty at 80–85°.

I. 1.1639 grm. of the air-dried salt lost at 82° 0.1184 grm. H_2O.
II. 0.7362 grm. of the air-dried salt lost at 83–85° 0.0740 grm. H_2O.
III. 0.6331 grm. of the air-dried salt gave 0.1648 grm. $CaSO_4$.
IV. 0.5287 grm. of the air-dried salt gave 0.1375 grm. $CaSO_4$.

	Calculated for $Ca(C_7H_4BrO_3)_2 . 3\,H_2O$.	Found. I.	II.	III.	IV.
H_2O	10.07	10.17	10.05		
Ca	7.61			7.65	7.65

0.6123 grm. of the salt dried at 82° gave 0.1774 grm. $CaSO_4$.

	Calculated for $Ca(C_7H_4BrO_3)_2$.	Found.
Ca	8.47	8.52

Sodic Bromfurfuracrylate, $NaC_7H_4BrO_3$. — This salt is readily soluble even in cold water, and crystallizes in anhydrous nodular aggregations.

I. 0.7612 grm. of the salt gave 0.2228 grm. Na_2SO_4.
II. 0.7589 grm. of the salt gave 0.2206 grm. Na_2SO_4.

	Calculated for $NaC_7H_4BrO_3$.	Found. I.	II.
Na	9.62	9.48	9.42

Argentic Bromfurfuracrylate, $AgC_7H_4BrO_3$. — The silver salt, formed by the addition of argentic nitrate to a neutral solution of the ammonium salt, proved to be nearly insoluble in water, and was apparently amorphous.

I. 0.3919 grm. of the salt gave 0.2261 grm. AgBr.
II. 0.4065 grm. of the salt gave 0.2347 grm. AgBr.

	Calculated for $AgC_7H_4BrO_3$.	Found. I.	II.
Ag	33.34	33.13	33.16

Ethyl Bromfurfuracrylate, $C_7H_4BrO_3 . C_2H_5$. — To a solution of the acid (5 parts) in somewhat more than its own weight of absolute alcohol (6.5 parts) was added concentrated sulphuric acid (3 parts), and the mixture heated upon the water bath for two or three hours. We found that too long heating should be avoided since decomposition then ensued, and a product was formed which undoubtedly was analogous to that obtained by Markwald.* We have, however, made no careful study of it. As soon as the etherification appeared to be complete, the ether was precipitated with water, dried with calcic chloride, and distilled under diminished pressure. The greater part of the product distilled at 151–152° under a pressure of 14 mm., and on cooling this distillate completely solidified. From ligroin the ether could be obtained in large flat prisms, which melted at 42°. It was readily soluble in alcohol, ether, chloroform, benzol, or ligroin and had a faint aromatic odor.

I. 0.1968 grm. substance gave 0.3168 grm. CO_2 and 0.0673 grm. H_2O.
II. 0.2251 grm. substance gave 0.1722 grm. AgBr.
III. 0.2545 grm. substance gave 0.1943 grm. AgBr.

	Calculated for $C_9H_9BrO_3$.	Found. I.	II.	III.
C	44.08	43.88		
H	3.67	3.80		
Br	32.65		32.55	32.49

We further attempted to make the amide, but found that the ether was hardly attacked by concentrated ammonic hydrate at 100°, and that at a much higher temperature (215°) most of the ether employed also remained unchanged.

BROMFURFURBROMACRYLIC ACID.

It already has been mentioned that bromfurfurdibrompropionic acid is decomposed by heat with the evolution of hydrobromic acid, and the simultaneous formation of a disubstituted furfuracrylic acid might be inferred. We have made many attempts to bring about this loss of one molecule of hydrobromic acid by more convenient and more economical methods, but without success. In alcoholic solution potassic hydrate gave chiefly the ethylen derivative and potassic carbonate, no matter how the conditions of the reaction were varied. A number of high boiling neutral solvents gave no better results than those obtained by heating the acid by itself. The bromfurfurdibrompropionic acid was therefore carefully heated in shallow crystallizing dishes immersed in a sulphuric acid bath. The hydrobromic acid thus escaped without blackening the product to any great extent. The temperature was slowly raised to 130°, and when at this point the formation of hydrobromic acid was no longer noticeable the residue was boiled with dilute ammonic hydrate filtered, heated with bone-black, and the filtered solution concentrated by evaporation. In this way sparingly soluble finely felted needles of ammonic bromfurfurbromacrylate were obtained, which yielded the acid in a state of purity.

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* *Loc. cit.*

I. 0.2246 grm. substance gave 0.2328 grm. CO_2 and 0.0317 grm. H_2O.
II. 0.2290 grm. substance gave 0.2373 grm. CO_2 and 0.0314 grm. H_2O.
III. 0.2059 grm. substance gave 0.2615 grm. AgBr.
IV. 0.2025 grm. substance gave 0.2571 grm. AgBr.

	Calculated for $C_7H_4Br_2O_3$.	Found.			
		I.	II.	III.	IV.
C	28.38	28.27	28.26		
H	1.35	1.57	1.53		
Br	54.05			54.04	54.03

Bromfurfurbromacrylic acid is almost insoluble even in hot water. It dissolves freely in ether or alcohol, and when precipitated by water from a hot alcoholic solution is obtained in fine clustered needles. At ordinary temperatures it is very sparingly soluble in chloroform or carbonic disulphide, but dissolves somewhat more freely on heating. The acid melts at 178–179° and small quantities of it may easily be sublimed without essential decomposition.

In spite of many attempts, we have been unable to obtain experimental evidence as to the position of the bromine atoms. We have also been unable to prepare definite products by the addition of bromine to the acid, or to form from it bromfurfurpropiolic by the elimination of hydrobromic acid. The following salts may serve for the better characterization of the acid.

Baric Bromfurfurbromacrylate, $Ba(C_7H_3Br_2O_3)_2 . 2 H_2O$. — This salt was prepared by adding baric chloride to a solution of the ammonium salt. It is very sparingly soluble even in boiling water, and crystallizes in lustrous scales. The air-dried salt contains two molecules of water, which it does not lose over sulphuric acid.

I. 1.4911 grm. of the air-dried salt lost at 120° 0.0674 grm. H_2O.
II. 0.8824 grm. of the air-dried salt lost at 120° 0.0399 grm. H_2O.

	Calculated for $Ba(C_7H_3Br_2O_3)_2 . 2\,H_2O$.	Found. I.	II.
H_2O	4.72	4.52	4.52

I. 0.2130 grm. of the anhydrous salt gave 0.0684 grm. $BaSO_4$.
II. 0.2229 grm. of the anhydrous salt gave 0.0712 grm. $BaSO_4$.
III. 0.4376 grm. of the anhydrous salt gave 0.1398 grm. $BaSO_4$.

	Calculated for $Ba(C_7H_3Br_2O_3)_2$.	Found. I.	II.	III.
Ba	18.85	18.88	18.78	18.78

Argentic Bromfurfurbromacrylate, $AgC_7H_3Br_2O_3$. — The silver salt made by precipitation is very sparingly soluble even in boiling water, and is apparently amorphous.

I. 0.2052 grm. of the salt dried over sulphuric acid gave 0.0951 grm. AgBr.
II. 0.2101 grm. of the salt dried over sulphuric acid gave 0.0977 grm. AgBr.

	Calculated for $AgC_7H_3Br_2O_3$.	Found. I.	II.
Ag	26.80	26.62	26.71

Potassic Bromfurfurbromacrylate, $KC_7H_3Br_2O_3$.—The potassium salt is sparingly soluble in cold water, more readily soluble in hot water, and crystallizes in slender clustered needles which are anhydrous.

I. 0.2275 grm. of the salt gave 0.0589 grm. K_2SO_4.
II. 0.5386 grm. of the salt gave 0.1407 grm. K_2SO_4.

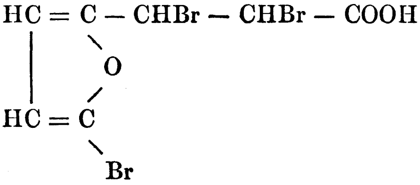
	Calculated for $KC_7H_3Br_2O_3$.	Found. I.	II.
K	11.70	11.62	11.72

Ethyl Bromfurfurbromacrylate, $C_7H_3Br_2O_3 . C_2H_5$. — The ethyl ether was made by heating for three hours on the water bath a solution of the acid (4 parts) in absolute alcohol (40 parts), with the addition of a small amount (3 parts) of concentrated sulphuric acid. The ether was then precipitated with water, washed with a dilute solution of sodic carbonate, and recrystallized from ligroin. It crystallized easily in radiated needles which melted at 55–56° and dissolved readily in alcohol, ether, chloroform, benzol, ligroin, or carbonic disulphide.

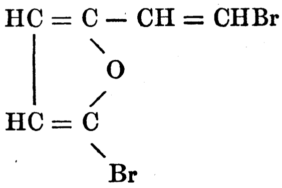
I. 0.3774 grm. of substance gave 0.4592 grm. CO_2 and 0.0849 grm. H_2O.
II. 0.2125 grm. substance gave 0.2464 grm. AgBr.
III. 0.2179 grm. substance gave 0.2525 grm. AgBr.

	Calculated for $C_9H_8Br_2O_3$.	Found. I.	II.	III.
C	33.34	33.19		
H	2.47	2.50		
Br	49.39		49.35	49.32

While we have been unable to establish with precision the constitution of the foregoing derivatives of furfuracrylic acid, the analogies offered by the derivatives of pyromucic and cinnamic acids naturally suggest the following formulæ for the substances in question: —



Bromfurfurdibrompropionic Acid.



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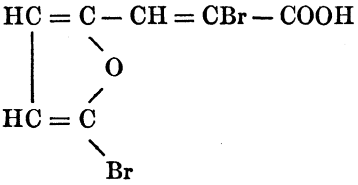
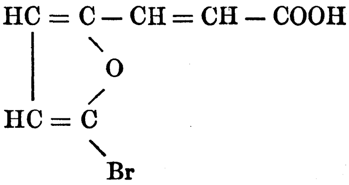


Bromfurfurbromacrylic Acid.



Bromfurfuracrylic Acid.